

# ***PROSPECTS FOR GLOBAL PRECIPITATION OBSERVING SYSTEMS***

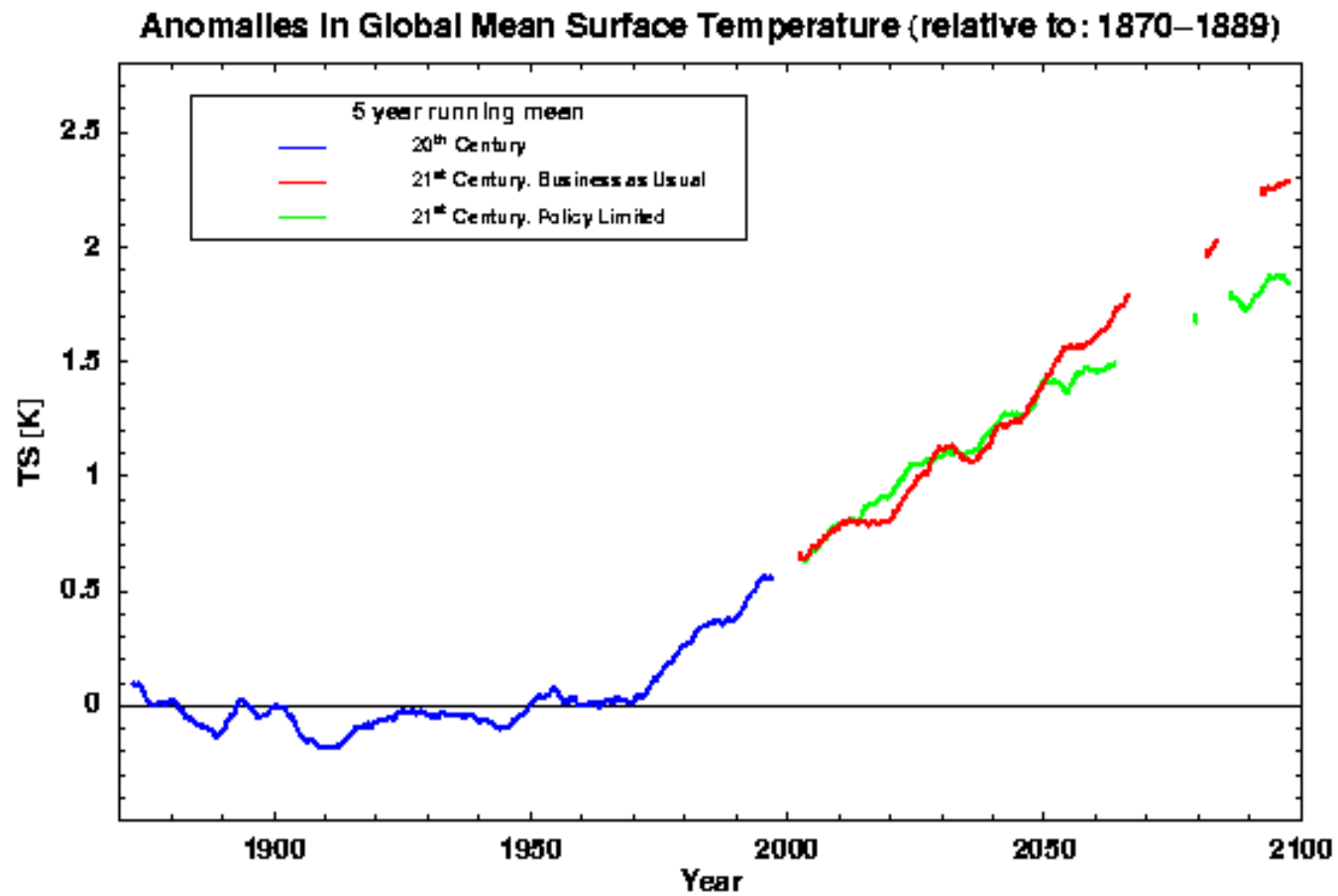
*Presentation to the GPM Planning Workshop  
Pierre Morel  
University of Maryland/Baltimore County  
16 May 2001*

# ***Why do we want to know global precipitation?***

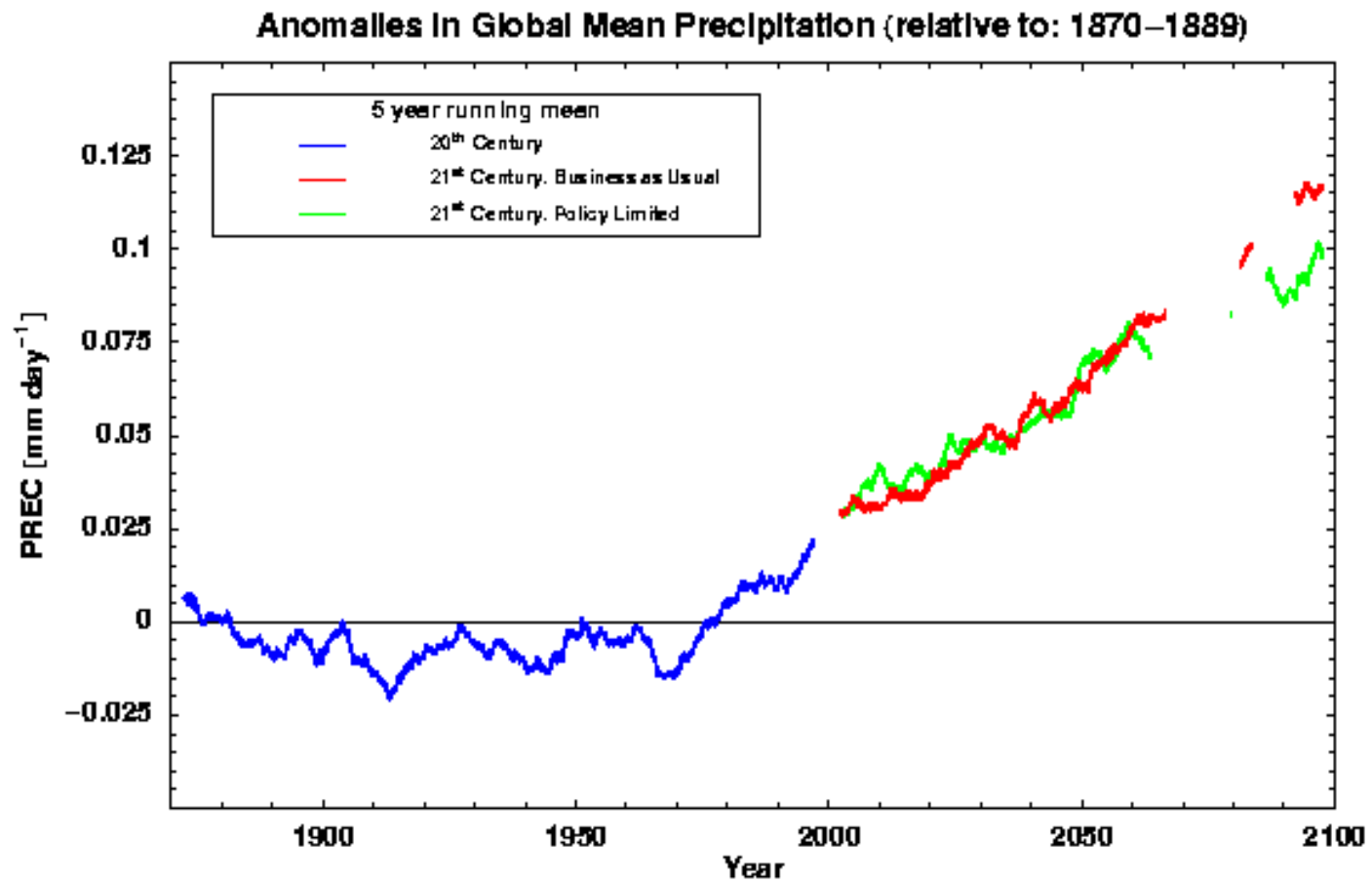
1. To resolve a scientific question about the rate of cycling of water in the Earth system.
2. To determine rainfall totals over continents in order to inform hydrologic models of water storage and river flow.
3. To improve weather and rainfall forecasts through assimilation of instantaneous precipitation data.

## *Is the Global Water Cycle Accelerating?*

- This issue matters, because the rate of water cycling may be directly related to the frequency and intensity of storms, and the amount of rainfall.
- We have **conflicting evidence** from climate models, e. g. NCAR Climate System Model:  
<<http://www.cgd.ucar.edu/~tls/CSM/tables.html>>  
and from observation, e. g. international Global Precipitation Climatology Project:  
<[http://daac.gsfc.nasa.gov/CAMPAIGN\\_DOCS/FTP\\_SITE/INT\\_DIS/readmes/gpcp\\_global\\_precip.html](http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/FTP_SITE/INT_DIS/readmes/gpcp_global_precip.html)>



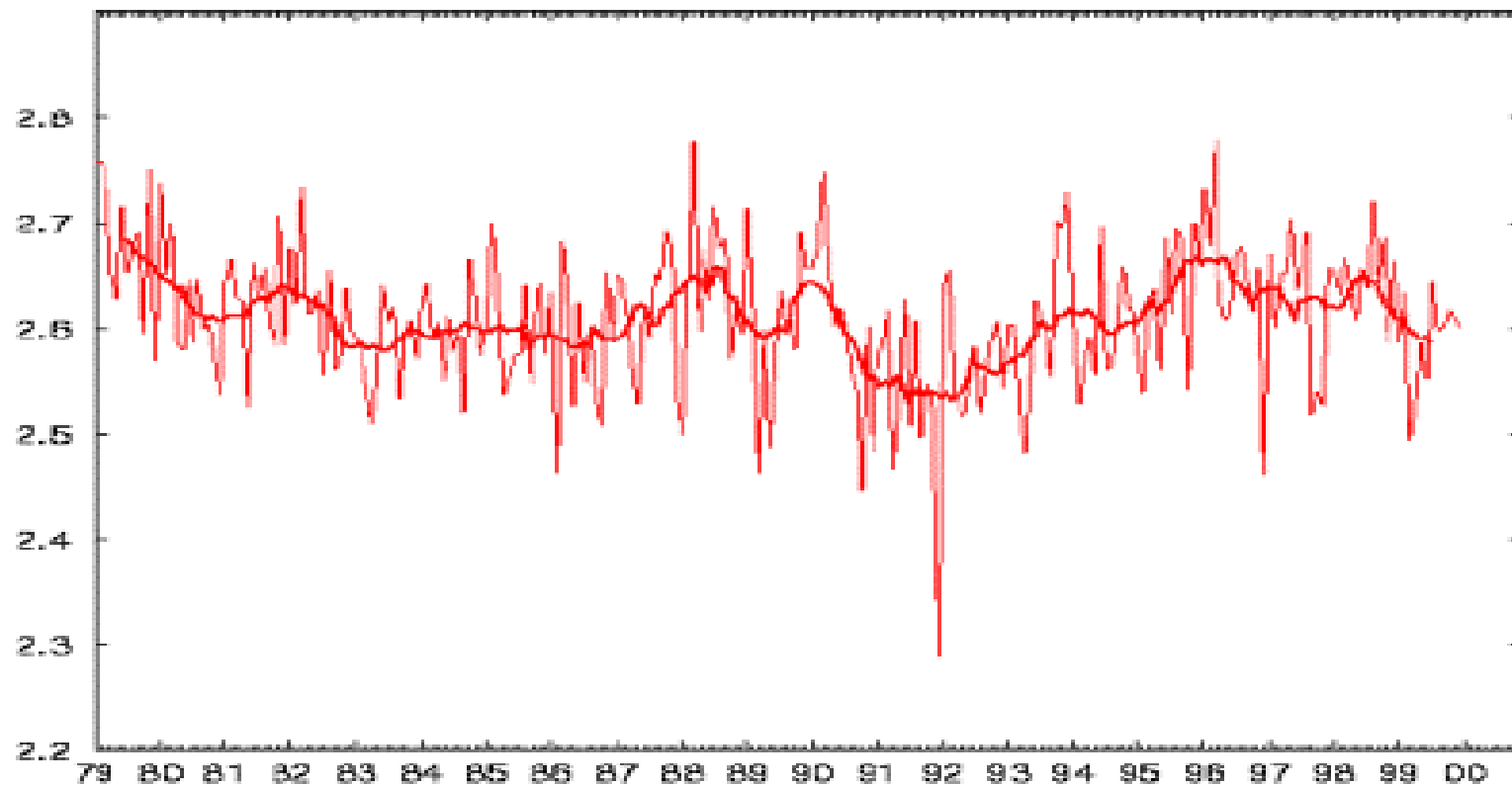
<http://www.cgd.ucar.edu/~tls/CSM/tables.html>



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## Globally Averaged Precipitation (90N–90S)

TOTAL

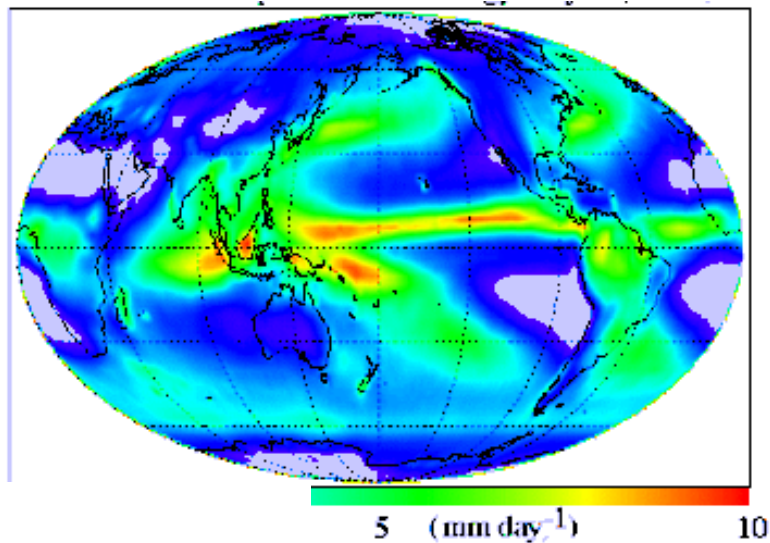


## *How can knowledge of water cycling be used to improve water system management?*

- The challenge is that of merging information from satellite measurements, ground-based weather radar observations, and rain-gauges, to deliver optimal estimates of **area-averaged rainfall** rate and accumulation.
- The goal is to eventually provide reliable (statistical) prediction of area-averaged precipitation on time-scales that most matter for strategic water system management.

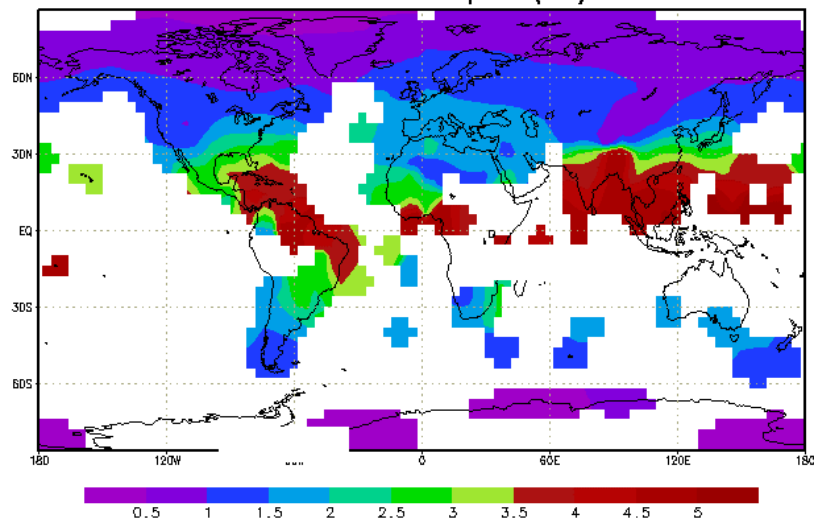
## Key Measurements for Precipitation Forecasting

Precipitation

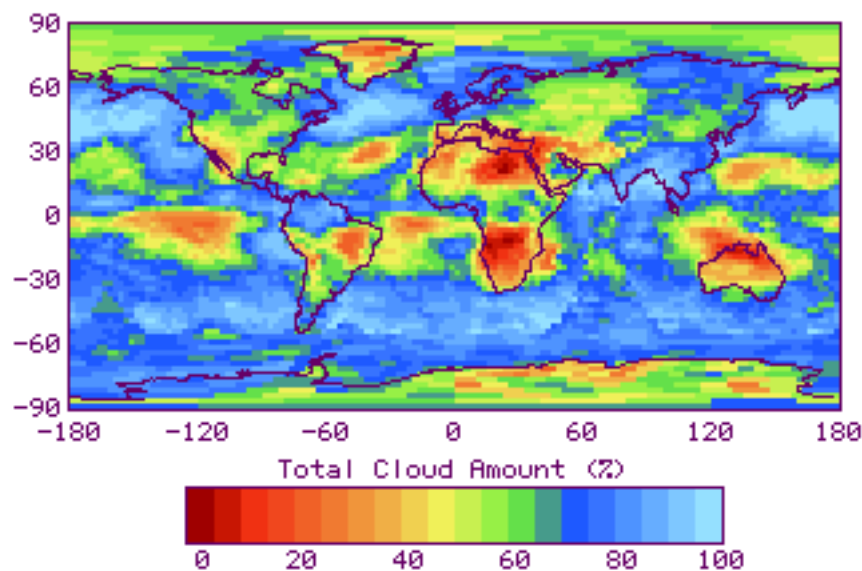


Water Vapor

12UTC Annual Mean Water Vapor (cm) Below 500mb



Cloud Amount





## *Can weather forecasts be improved by assimilation of global precipitation data?*

- Comparing model predictions with observed precipitation globally is a powerful diagnostic **research tool** for improving model formulations of “wet processes” throughout the Earth system (i. e. evaporation and transformation, not just condensation processes).
- Assimilation of observed precipitation and latent heat release provides **augmented predictability** of future weather developments, a valuable result for NWP applications.

# ***GPM is an **essential step** toward systematic observation of global precipitation.***

TRMM has demonstrated the possibility of “training” rainfall retrieval algorithms based on passive microwave observations only, using cloud structure information from microwave Precipitation Radar observations.

The core GPM mission and other concurrent cloud-research satellites will constitute a powerful tool for **investigating cloud and precipitation processes** in the global atmosphere, and relating the passive and active signatures of precipitating clouds.

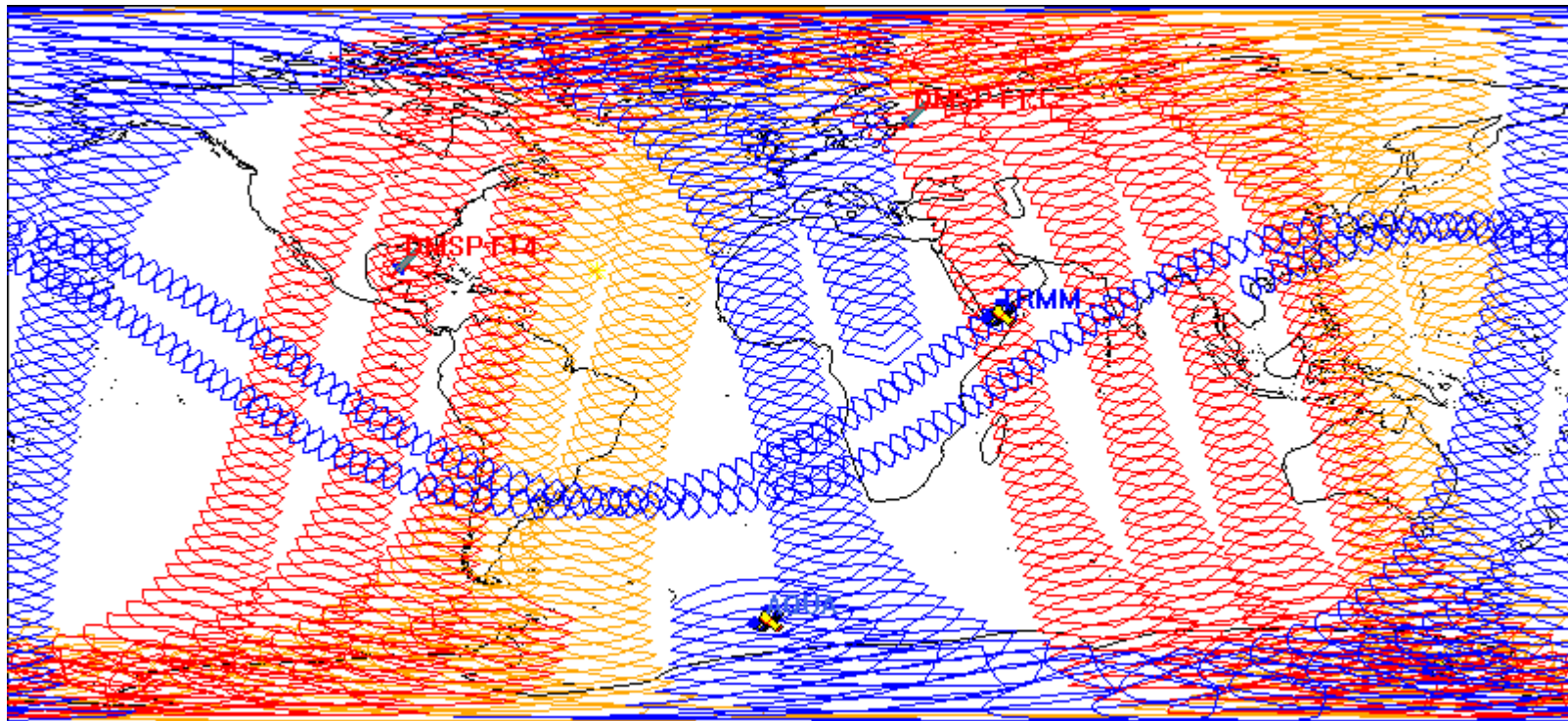
# ***GPM is an essential step toward **systematic observation** of global precipitation.***

The GPM concept includes the seed of a future **Global Precipitation Observing System**, in the guise of a constellation of research and operational satellites, equipped with passive cloud-sensing microwave imagers.

The low Earth-orbit constellation is needed to provide both relatively high spatial resolution (beam-filling factor) and frequent observations (3-hourly or better).

# EOS-Era Constellation Coverage

TRMM + DMSP(F15) + DMSP(F16) + AQUA + ADEOS II



3-hour sensor ground trace